Local Administration Journal 16(1) • January – March • 1-22
Received: December 7, 2022 • Revised: February 19, 2023 • Accepted: March 8, 2023
RESEARCH ARTICLE

Digital Technology for Monitoring the Sustainable Development Goals: A Case of Nepal

Shyan Kirat Rai
Deputy Director of Studies
Nepal Administrative Staff College,
Jawalakhel, Lalitpur, Nepal

Anil Kumar Gupta
Deputy Director of Studies
Nepal Administrative Staff College,
Jawalakhel, Lalitpur, Nepal

Abstract

A robust monitoring framework with a credible database is crucial for regularly tracking Sustainable Development Goals (SDGs). The use of digital tools to capture the data for the SDGs' indicators helps to quicken the monitoring process. Continuous real-time progress monitoring via digital systems is the primary requirement for the timely achievement of SDGs. In this backdrop, this paper aimed to analyze the presence of a digital platform for monitoring SDGs in Nepal. Primary as well as secondary sources of information were used to understand the existence of a digital platform for monitoring the SDGs. The result showed that the National Planning Commission (NPC) established monitoring metrics and an online platform to share the SDGs' progress. The National Statistics Office (NSO), formerly known as the Central Bureau of Statistics, is primarily involved in generating and filling the data gap required for monitoring the SDGs, but most of the data are generated through periodic surveys. Real-time disaggregated data generation through digital tools compatible with the SDGs is a critical challenge in Nepal to track progress regularly. Online platforms can help minimize data gaps, make data accessible to all levels, and generate new data sets to assess the SDGs' timely progress. Therefore, technical intervention is the primary requirement to generate credible real-time data and monitor the SDGs' progress.

Keywords

Digital Technologies, SDGs, Monitoring, Nepal

CORRESPONDING AUTHOR
Anil Kumar Gupta, Nepal Administrative Staff College Jawalakhel, Lalitpur, Nepal
Email: cdps10gupta@gmail.com

Introduction

The Sustainable Development Goals (SDGs) are a global development agenda that aims to be achieved by 2030. The achievement of the SDGs by 2030 has shifted the focus to implementation, monitoring, tracking, and evaluation. Monitoring would provide a much more detailed picture of how the SDGs are being implemented in a given nation. Constantly monitoring the status of the SDGs' indicators brings the development on the right track. A strong and effective monitoring system is essential for regularly tracking the progress of the SDGs' indicators, even though it is a challenging task. Continuous real-time monitoring of the SDGs' indicators gives up-to-date information on the performance of each goal, and assists policymakers and decision-makers for evidence-based, informed decisions. The international community has appropriately begun to move its focus to the indicator framework and related monitoring systems with the support of technology to better implement the SDGs (Schmidt-Traub et al., 2015). However, most countries (governments) are unable to gather real-time data on all the SDGs' indicators, due to a lack of digital technologies to capture and transfer the data to the required points (Saner et al., 2020). Therefore, special attention should be paid to capacity building for the collection of quantitative data for SDGs' indicators, where digital technologies can be a great means of support. A collection of quantitative and measurable data for each indicator of the SDGs should be produced and assessed to track progress towards achieving the SDGs within the defined time frame (Hák et al., 2016). Indicators allow for the tracking of progress over time, which is crucial for keeping track of goals and objectives, as well as informing the policymaking process as time passes (Avtar et al., 2020). The SDGs' indicators assist countries in tracking and reporting their progress on the SDGs and targets (Marcovecchio et al., 2019).

There should be trustworthy and up-to-date real-time data on SDGs' indicators to know the status of implementation and track the progress of the SDGs, which can be generated via digital technologies. Having real-time data on the SDGs' indicators is crucial for effectively monitoring and analyzing progress towards achieving the SDGs. Delayed data may result in inaccurate or incomplete assessments, missed opportunities for timely adjustments, a hindered ability to make informed decisions on necessary actions, and prolonged setbacks in achieving the SDGs. In contrast, real-time data enables informed decision-making and timely adjustments to maintain progress towards achieving the SDGs. Therefore, the importance of real-time data in monitoring progress towards the SDGs cannot be underestimated, but obtaining real-time credible and accurate data is challenging. This challenge can be addressed through the use of digital technology. Digital

technology assists in the collection and analysis of data on the SDGs' indicators, which can be used to track the SDGs' progress and act accordingly. At present, digital technology has evolved in such a way that it provides new approaches for addressing issues related to sustainable development by providing technologies through which users at the ground level can capture the relevant data, provide those data to information systems that can analyse the input data in real-time, and provide statistical outputs for action (Busch, 2011; Lock & Seele, 2017).

Existing monitoring tools in Nepal are investigated to explain the necessity for digital technology in monitoring SDGs. Primary and secondary sources of information were used to understand the presence of digital technologies in the monitoring of SDGs. The NPC's initiatives, reports and literature in the field of digital technology and SDGs were reviewed to bridge the gap in leveraging digital technology to achieve the SDGs in Nepal. This paper aimed to contribute to this discussion by exploring how digital technology can help in monitoring progress toward the SDGs' targets in Nepal. The paper will generate evidence on the contribution of digital technology in monitoring SDGs, which will be useful in taking corrective action to monitor the SDGs' progress to achieve them on time.

The paper is organized as follows: Section 1 discusses the study's issues. Section 2 includes an overview of the literature on the SDGs and digital technology. Section 3 discusses the research methods. Section 4 includes a result, discussion, and conclusion.

Literature Review

SDGs: An Overview

In the 1960s, increased awareness of pollution and environmental degradation prompted several non-governmental organizations to advocate more environmentally sustainable practices (Spash, 2011). Simultaneously with the pressure from these groups (Robra & Heikkurinen, 2019), the World Commission on Environment and Development (also known as the Brundtland Commission) was established in 1982. This commission issued a report titled 'Our Common Future' in April 1987, which defined sustainable development:

Sustainable development is a development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. The concept of sustainable development does imply limits – not absolute limits, but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effect of human activities (WCED 1987, p. 8).

This definition emphasizes intergenerational and environmental concerns, conveying a strong message that the present generation's needs should be handled suitably without disrupting the survival needs of future generations. This term influenced sustainable development discourse considerably, and was influential in driving global efforts to ensure a prosperous future for all (McInnes, 2018). An important moment in the history of sustainable development was manifested in the Earth Summit (1992), the Millennium Declaration (2000) and Rio+20 (2012). The Millennium Development Goals (MDGs) were set out in the Millennium Declaration (2000) with the aim of achieving them by 2015 but, sadly, the predefined goals were not completely achieved in many countries. Developing countries, however, have made substantial progress toward achieving the MDGs (Sachs, 2012). While the MDGs were a move in the right direction, they were not without criticism (Morton et al., 2017). The MDGs were heavily criticized for being political preferences of development agencies and a select community of donor governments (Jönsson & Bexell, 2021). There was also criticism that there was not enough analysis to explain why these goals had been set as targets, as well as inadequate data available to compare results, especially in addressing inequality within countries (Deneulin, 2009). Nonetheless, the enforcement and accomplishment of the MDGs paved the way for the SDGs.

After the expiration of the MDGs, and with the determination to accomplish the remaining priorities and transfer the planet into a sustainable path for a better future, the SDGs were proposed. The SDGs are a set of 17 goals and 169 targets that were adopted by the 193 member countries at the UN General Assembly in New York and are to be accomplished by 2030.

Figure 1. SDGs

source: https://sdgs.un.org/goals

The 17 goals and 169 targets set an internationally legitimized benchmark for pro-poor, sustainable development initiatives (Florini & Pauli, 2018). The SDGs are a plan of action for people, the planet, and prosperity that focuses on three dimensions of sustainable development, namely the economic, social, and environmental (United Nations, 2015). The SDGs are inextricably linked, and as such, no single target will be able to shift the global system into a secure and just operating space on its own (Haywood & Funke, 2019).

Practices of SDGs in Nepal

Nepal, as a UN member, has committed to the 2030 SDGs, and many efforts are being undertaken to contribute to the SDGs' realization (NPC, 2017a). The constitution of Nepal, which was adopted in 2015, contains provisions that foster an enabling environment for the implementation of the SDGs in the spirit of no one being left behind, and it has begun to integrate the SDGs into national plans, programs, and projects, as well as budgetary systems (NPC, 2017a). The government of Nepal has begun the process of incorporating the SDGs into its national development plans since the implementation of the SDGs. Nepal's 14th plan (2016/17–2018/19) is in line with the SDGs. The five pillars of this plan are consistent with the SDGs, as shown in Table 1.

Table 1. 14th Plan Aligned with the SDGs

S.N	Pillar	SDGs
1	Infrastructure	Goals 6, 7, 9 and 11
2	Social	Goals 3 and 4
3	Economic	Goals 1, 2, 8, 9, 10 and 12
4	Governance	Goals 16 and 17
5	Cross-cutting	Goals 5, 13, and 15

Source: NPC, 2017a, P. 8

The goal of the plan was to establish a self-reliant and prosperous nation that guarantees the provision of fundamental social services, satisfactory nutrition, healthcare, energy, and job security. Additionally, the plan calls for efforts to achieve the SDGs with the aim of elevating Nepal from a low-income country to a middle-income one by 2030 (NPC, 2016). Following the successful implementation of the 14th plan, the government of Nepal prepared the 15th development plan (2019/20-2023/24) in accordance with the framework of the constitution and the SDGs for the transformation of Nepal into a developed country within the long-term vision of 25 years (until 2100 B.S.). The 25-year long-term vision 2100 includes the goals, targets, and milestones of the 2030 agenda. The plan identified strategic intervention in the areas of economic development, employment, infrastructure,

industrialization, and sustainable production and consumption, which are expected to facilitate the attainment of the targets set for SDGs 8, 9, 11, and 12 (NPC, 2019).

District Development Committees, which serve as the key oversight and supervisory authorities for local development activity, have requested that their functions be carried out in such a way that they contribute to the achievement of the SDGs (NPC, 2017a). In addition, the government of Nepal emphasized the roles of the private sector, cooperatives, civil society, development partners, and other development actors in incorporating the SDGs into their respective strategies. Similarly, various committees have been formed to ensure the successful implementation and attainment of the SDGs, including the High-level Steering Committee, Coordination and Implementation Committee, and Implementation and Monitoring Thematic Committees. Local governments have been directed by the NPC and line ministries to implement the SDGs into their strategies and activities. Likewise, the Nepal Administrative Staff College, with the cooperation of the NPC and the UNDP's technical support, has launched a program to assist local governments in the localization and integration of the SDGs in their policy plans, programs, and budget.

The NPC has prepared and released the SDGs' Status and Roadmap: 2016-2030. Within the report, the monitoring system aligns and updates metrics for national SDGs with global ones. The national report of the SDGs presents them in a model form with specific goal-wise indicators, outlining the local indicators needed to monitor the SDGs' compliance. This report includes indicator-based longitudinal data for 2015, as well as standards for 2019, 2022, 2025, and 2030. (NPC, 2017a). The roadmap report comprises 494 indicators, of which 257 are local indicators, and 479 of the indicators are to be monitored, but not 15 global indicators that are duplicated, as shown in Table 2.

Table 2. SDGs Indicators

S.N	Goals	Targets	Indicators		
			Global	Added by Nepal	Total
1	End poverty (End poverty in all its forms everywhere)	7	13	17	30
2	Zero hunger (End hunger, achieve food security and improved nutrition and promote sustainable agriculture)	8	14	18	32
3	Healthy lives and well-being (Ensure healthy lives and promote well-being for all at all ages)	13	28	32	60

Table 2. SDGs Indicators (Cont.)

S.N	Goals	Targets	Indicators		Total
			Global	Added by Nepal	
4	Inclusive and quality education (Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all)	10	12	32	44
5	Gender equality (Achieve gender equality and empower all women and girls)	9	14	22	36
6	Clean water and sanitation (Ensure availability and sustainable management of water and sanitation for all)	8	11	14	25
7	Affordable and clean energy (Ensure access to affordable, reliable, sustainable and modern energy for all)	5	6	9	15
8	Decent work and economic growth (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all)	12	16	14	30
9	Industry, innovation and infrastructure (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation)	8	12	8	20
10	Reduce inequalities (Reduce inequality within and among countries)	10	14	13	27
11	Sustainable cities and communities (Make cities and human settlements inclusive, safe, resilient and sustainable)	10	14	16	30
12	Responsible consumption and production (Ensure sustainable consumption and production patterns)	11	13	14	27
13	Climate action (Take urgent action to combat climate change and its impacts)	5	8	16	24
14	Life below water (Conserve and sustainably use the oceans, seas and marine resources for sustainable development)	10	Not relevant for Nepal		

Table 2. SDGs Indicators (Cont.)

S.N	Goals	Targets	Indicators		
			Global	Added by Nepal	Total
15	Life on land (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss)	12	14	17	31
16	Peace, justice and strong institutions (Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels)	12	24	7	31
17	Partnership for goals (Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development)	19	24	8	32
	Total	169	237	257	494

Sourece: NPC, 2020, P. 12

The NPC and sectoral line ministries use the results-based monitoring and evaluation framework to track and assess progress using indicators derived primarily from the SDGs (NPC, 2017a). Parliamentary commissions also play an important role in tracking progress (NPC, 2017b). The SDGs Implementation and Coordination Committee and nine SDGs Implementation and Monitoring Thematic Committees work in coordination with stakeholders, maintain databases, monitor indicators, and oversee resources. The government of Nepal has built monitoring indicators as well as an online platform (http://sdg.npc.gov.np/en/) to disseminate information on the SDGs' monitoring status (Tsumagari & Gupta, 2019), yet there is no specific mechanism to monitor the SDGs in real-time. The SDGs' online platforms, as of 2023/02/15, display SDGs' status updates only up to 2019, which can create difficulties in making informed decisions, implementing corrective actions, and monitoring progress towards achieving the SDGs on time. Delaying progress tracking can give an inaccurate picture of progress towards the SDGs, making it challenging to measure the effectiveness of policies and programs. The longer the delay in the tracking progress, the greater the risk of taking corrective action for the timely achievement of the SDGs. Delayed progress tracking can also reduce the available time to plan and implement interventions to address SDGs' challenges, making it difficult to respond effectively to emerging issues like natural disasters, pandemics, or economic

shocks. This can also reduce accountability, making it challenging to hold governments, organizations, or individuals responsible for SDGs' progress. Real-time progress tracking of SDGs using digital technology can provide a solution to these problems. Recognizing the significance of digital technology, the government of Nepal launched digital governance initiatives under the Digital Nepal Framework-2019, intending to create a framework for action targeted at harnessing the capabilities of digital technologies to support the accomplishment of the SDGs' implementations.

SDGs Implementation: Data Challenges

In Nepal, there is a big discrepancy between government-recorded data and data produced by non-governmental organizations, particularly in data relating to violence, criminality, human trafficking, and human rights violations. Data collection from the national to international level should be based on existing reporting mechanisms to avoid duplication (Marcovecchio et al., 2019). The existing statistical data acquisition system has some flaws, including the distribution of data sources over many windows other than census and economic surveys, as well as social and governance-related surveys falling outside the National Statistics Office's (NSO) authority. The data revolution that is occurring because of technical developments, the evolution of big data, and the growing trend of open data systems has yet to be evaluated and implemented. While donors must maintain current contributions to statistics, the recipient countries must commit to filling the gap by mobilizing domestic resources behind the National Strategy for the Development of Statistics. Access to public and private sector data in Nepal is difficult for independent monitoring organizations outside of the government. The majority of the surveys are financed by donors, and are subjected to delays due to aid mobilization. The government of Nepal has to make necessary legal, organizational, and operational changes in the existing data system to generate and share high-quality data for monitoring the SDGs on time (NPC, 2017b). The proposed SDGs' indicators were developed using sectoral data from the government's 14th plan, administrative data from government agencies, and publications from non-governmental organizations. For some indicators related to governance, international sources have been referred to when national data are not available. In cases where no data are available for the proposed indicators, they have been left blank with clear indication of the data generation proposal in the next couple of years.

The pursuit of the SDGs in Nepal is associated with several data challenges, including:

Limited data literacy and capacity: Many organizations and individuals in Nepal lack the capacity to collect, analyze, and use data effectively, which can hinder knowledge of the progress towards the SDGs.

Limited data availability and poor quality: There is a lack of reliable, up-to-date data on key SDGs' indicators in Nepal. This makes it difficult to track progress, identify areas of need, and make evidence-based decisions. Even when data are available, the quality may be questionable. Poor data quality can lead to inaccurate or misleading results towards the SDGs.

Limited use of technology: While the use of technology can help improve data collection and analysis, there is still limited use of these tools in Nepal.

Inadequate data sharing: In Nepal, there is a lack of a data-sharing culture among different organizations and sectors, which can limit the usefulness of the data for the achievement of the SDGs.

Insufficient data integration: Data integration is important for creating a comprehensive picture of progress towards the SDGs, but there is limited integration of data from different sources in Nepal.

Insufficient focus on disaggregated data: Disaggregated data are important for understanding disparities and ensuring that no one is left behind, but there is still a limited focus on collecting and using disaggregated data in Nepal.

Limited engagement with local communities: Engaging with local communities is important for understanding their needs and perspectives, but there is still limited engagement with communities in Nepal in data collection and analysis aligned with the SDGs.

Digital Technology

The world is undergoing a shift towards the digitalization era, where innovative digital and computer technologies are now essential for many of our daily activities (Mondejar et al., 2021). Digitalization possesses immense power as it not only enables automation, but also captures and stores data about tasks and activities, creating a record that can be analyzed to enhance work processes and organization (Zuboff, 1988). Digital technologies have permeated and transformed every aspect of economic and social activities, and their application domains span various sectors, including agriculture, manufacturing, professional services, healthcare, and beyond (Ciarli et al., 2021). Digital technology has the ability to store and process vast amounts of information quickly and efficiently, and has enabled the creation of massive databases, analysis of complex data sets, and the making of predictions and decisions based on real-time information. Every type of organization, including the public and government sectors, has come to realize the importance of digital technology, and is utilizing it to conduct its core business, resulting in changes to business processes and the way organizations operate to provide service delivery (Kumar et al., 2017). However, this technology is often used inefficiently or inappropriately. In the worst situations, many public organization leaders fail to grasp the opportunities offered by technology and, as a result, are unable to transform their organizations

into ones that are accountable, transparent, and citizen-centric (Bongiorno et al., 2017; Dunleavy & Margetts, 2015; Kumar et al., 2017). Public organizations that fail to adopt digital technology risk not providing their citizens with efficient, effective, and easily accessible services. Digital technology not only supports organizations in providing efficient and effective services, tracking and monitoring their performance, and making informed decisions, but also enables monitoring of the progress of the SDGs by providing real-time data on various indicators. These data can then be used to inform policies and decision-making, and to track progress towards the SDGs over time. By providing real-time data on various indicators, digital technology can help ensure that governments and other organizations are held accountable for their progress towards the SDGs. It can also help promote transparency by making data publicly available, allowing citizens to monitor progress towards the goals and hold their governments accountable for their actions.

Study Method

This is a descriptive study, and is heavily based on secondary sources of information. The sources of information included in the study are Nepal's SDGs' baseline report, the SDGs' status and roadmap 2016-2030, a national review of the SDGs, the 14th plan, the 15th plan, the integrated national evaluation action plan, and the national monitoring and evaluation guidelines 2013, among others. Similarly, we also gathered primary information through key informant interviews. We purposively selected six key informants, comprising one representative from the NPC working in the SDGs sector and five IT officers from local governments, considering factors such as access to relevant information, specific expertise or knowledge in the research area, and their consent to participate in the study. Our key informants were informed about the purpose of the study and asked to participate in an interview. We prepared an interview checklist to guide the interview process before conducting it. The interview checklist was particularly focused on the presence and usage of digital technology for generating SDG-friendly data, and tracking progress towards achieving the SDGs on time. The interview was conducted with their consent in the Nepali language to gain a comprehensive understanding. After the interview with key informants, the qualitative information was transcribed, coded, analyzed, and its meaning was derived.

Results and Discussion

Data Ecosystem

The SDGs demand high-quality data at all levels from all countries. The United Nations has highlighted the importance of data quality and data gathering capabilities to optimally

measure various indicators, as well as the necessity for data revolution to improve data quality (United Nations, 2013). Reliable, valid, accurate, clear, complete, trustworthy, comparable, and real-time desegregated data are a primary and mandatory prerequisite to identifying the performance of SDGs, and resolving data gaps in the implementation of SDGs. For this, quantitative data should be collected, disseminated, and used at all levels of government in all nations, but producing disaggregated real-time quality data, particularly in the developing world, is difficult. The data revolution provides valuable ways and means to gather, organize analyze and disseminate existing data in ever more efficient and effective ways (Webster & Ravnborg, 2016). The data revolution is characterized by new technologies, stakeholder alliances, and platforms for aggregating data. Additionally, innovative ways of using data by analysts, policymakers, and people have emerged. Therefore, the data ecosystem/environment is essential for achieving the SDGs, and providing an important forum for enforcing and monitoring the SDGs' success (Webster & Ravnborg, 2016).

Measuring the SDGs requires large volumes of data to be captured and analyzed but major data gaps exist, and these gaps vary according to the location, level of collection, various social and cultural groups, and the sector or area concerned (Marcovecchio et al., 2019; Webster & Ravnborg, 2016). Top of Form

Many governments still do not have access to sufficient data on their whole population, which is a common problem in many developing countries (Maaroof, 2015). Many countries, including Nepal, still have poor data, and existing data do not sufficiently cover too many indicators of the SDGs, which creates challenges for monitoring the SDGs. Nepal has proposed a total of 494 indicators (479 without repetition) to monitor and evaluate progress towards the SDGs. However, only 35 percent of these indicators have data available on a regular, periodic basis, while 55 percent are expected to be available through census, surveys, and administrative records, and the remaining 10 percent of data for tier three indicators are unavailable. Out of all the indicators, data are available for only 218 (44%) indicators. Major data gaps exist in Nepal for several SDGs, including Hunger (Goal 2), Water (Goal 6), Industry and Infrastructure (Goal 9), Cities (Goal 11), Consumption and Production (Goal 12), Climate (Goal 13), and Partnership (Goal 17) (NPC, 2020). The data gap should be filled at the earliest opportunity. In the assumption that no one is left behind, the SDGs require that data be disaggregated as broadly as practicable, not just by gender or age, but also by employment, nationality, migratory status, disability, geographical position, and other related features in various national contexts (United Nations, 2019). When we inquired of our key informants about desegregated statistics that align with the SDGs, the key informant from NPC remarked that there is a lack of such statistics. He explained:

The NSO, as the main agency responsible for collecting, analyzing, and disseminating official statistics in Nepal, is involved in producing data aligned with the SDGs. However, most of the data are generated through periodic surveys, rather than in real-time. Additionally, in some cases, disaggregated data on certain indicators are lacking. Along with the NSO, other government agencies also produce sectorial data aligned with the SDGs. Generally, the data produced by these agencies are used to track the progress of the SDGs. The data have to be collected from the local level, for which the NPC mobilizes agencies and people, yet the rate of data collection is slow and ambiguous.

We asked the same question of the IT officers of the local governments. Most of them mentioned that they have not yet focused on the collected SDGs-friendly data, but the data collected in the areas of health, education, agriculture, local economy, vital statistics, and so on are indirectly linked with the SDGs. One of them mentioned that:

Our local government has prepared a municipal/village profile based on the 2011 census data. However, data on the majority of the SDGs' indicators are lacking, and they are a decade old. These data are rarely used. We do not have scientifically compiled disaggregated data directly related to the SDGs. Data generation directly focused on the SDGs is a lower priority, but we regularly collect data related to education, health, agriculture, vital registration, and other related areas. These data are not integrated into one place and are scattered across different sections of the local government. We use the data as and when needed.

It gives some insight into the data ecosystem in Nepal. The recent 2021 population census will somehow close existing data gaps. National surveys in Nepal, including the national population and household census, conducted every ten years, national agricultural censuses, five-year multi-indicators cluster surveys, the Nepal Demographic and Health Surveys and the Nepal Living Standard Surveys, and industrial and labor force surveys, have provided much of the data for the analysis of the SDGs' performance. In addition, the line ministries' management information system often provided administrative details useful for monitoring the progress. The annual report of the Department of Health Services, the education flash reports, the annual economic survey, the National Human Rights Commission's report, and the Central Bank's annual report are valuable sources that provide evidence to track the SDGs (NPC, 2017a). Other sources of information included the annual and periodic reports of the World Bank, Asian Development Bank, the International Monetary Fund, United Nations Development Program, International Labour Organization, United Nations International Children's Emergency Fund, World Health Organization, Food and Agriculture Organization, UN Women, World Food Program, Transparency International, the Human Rights Commission and the South Asian Association of Regional Cooperation Secretariat. Some data, which are not produced annually have been extrapolated and interpolated to establish the baseline results for 2015 and progress

monitoring for 2016. Some data are published globally, but are not owned by Nepal (NPC, 2017b). Data gaps in Nepal are threatening to hinder the achievement of the SDGs. Making existing data generation systems robust and ensuring that databases are consistent with SDGs' requirements have been major obstacles in monitoring the progress of SDGs regularly. Some SDGs' indicators lack base year statistics requiring the conduct of new baseline surveys, in particular on the intra-household nutrition status, poverty, education, and health status by sex, age, disability status, social classes, geography, and administrative unit (NPC, 2017a). Likewise, different agencies in Nepal are involved in data generation but lack coordination and collaboration. The government of Nepal should develop robust national strategies for a data development and sharing mechanism, which is required in monitoring the status of the development goals.

Nepal has more opportunities than ever before. The national data collection and processing system needs to be redesigned to acquire a well-developed disaggregated data collection system. The government of Nepal should develop comprehensive national data creation strategies and it is imperative to update the national data collection and processing system, and implement a well-developed disaggregated data collection system (NPC, 2017a). National statistical offices will be crucial to ensure the successful implementation of the SDGs (Saner et al., 2020). The NSO is the national statistical office with the legal and financial means of marshalling all data criteria needed for monitoring the SDGs. The government needs to make regulatory, bureaucratic, and operational improvements in the current data structure required to produce and share broad, high-quality, and timely data to track and monitor the success of the SDGs (NPC, 2017b). Digital technology can help to reduce data gaps, make data available to everyone at every level, and generate new data sets to measure the success of the SDGs by establishing the systems that acquire the required data. The digital system has been developed with a framework that binds all organisations together using an interoperability framework, enabling concerned organizations to use the data acquired or generated by one another.

Monitoring SDGs

The monitoring process assesses current progress and gives critical opportunities for proposing corrective action regarding a country's SDGs' implementation priorities and strategies (Saner et al., 2020). The progress made over time in achieving SDGs is monitored and measured by using a set of quantifiable indicators for each of the goals (Avtar et al., 2020). However, the measurement of indicators that represent progress towards such goals is challenging (Marcovecchio et al., 2019). A country implementing SDGs to enhance the development status of the country regularly requires data to monitor the condition of the SDGs. A set of quantifiable indicators, targets, and observable data specific to each goal has been devised to monitor the

progress of each goal, so that the status of the goal can be realised at any time (Hák et al., 2016). Indicators are the backbone of monitoring progress towards the SDGs at the local, regional, national, and global levels, and form the foundation for monitoring progress towards SDGs at these levels (Schmidt-Traub et al., 2015). The UN Statistical Commission has currently developed an indicator framework for monitoring and reporting on the global implementation of the SDGs. Some member states also have developed their own set of indicators to assist in monitoring and tracking progress. The United Nations Statistics Division, the Inter-agency and Expert Group on SDG Indicators, the member states represented by their National Statistical Offices and the UN agencies are key ecosystem actors in monitoring, tracking, and reporting progress on SDGs (Marcovecchio et al., 2019). As per Schmidt-Traub et al. (2015), global monitoring indicators are designed to be completely universal, but some may not apply to all countries. They further argued that SDGs cannot be achieved in time unless an appropriate global monitoring framework complements the national monitoring standards.

The global and national monitoring frameworks should complement each other. The countries are the key agencies responsible for establishing a reliable, strong, effective, and comprehensive monitoring framework for tracking and evaluating whether SDGs are being applied as defined. Nepal is a federal republic where the government has been distributed to three levels which are the central, provincial, and local. So, every level of government executes the different goals of the SDGs, and the target indicators have to be collected from every level of government for the monitoring process. Strong data collection, analysis, and management systems are required for progress monitoring and reporting of the SDGs at the central, regional, and local levels (NPC, 2017a). The monitoring, tracking, and assessment of the SDGs would have to be carried out through the combined efforts of the government, private sector, civil society organizations, and international development partners and a good monitoring system with reliable data is key to the SDGs' performance (NPC, 2017b). Digital technology can be the best way for capturing field data and continuous real-time progress monitoring of the performance of SDGs, as it supports the virtual network between various governments and agencies at various levels allowing a quick and free flow of required data. We queried our key informant from the NPC about the presence of digital technology for monitoring the progress of the SDGs. In response to this inquiry, he quoted:

> The NPC has created an online dashboard to disseminate information on the monitoring status of the SDGs. The progress status of the SDGs is updated on the dashboard, and concerned individuals and organizations can access the information from it.

The creation of an online SDGs' dashboard is a crucial step in addressing progress. However, dashboards lack real-time monitoring functionality, and their primary role is to show the SDGs' status, which is necessary but insufficient for real-time tracking progress, and for taking corrective action. The online dashboard for SDGs, as of 2023/02/15, shows the SDGs' progress only until 2019, which may pose challenges in taking corrective actions and adjusting progress towards meeting the SDGs on time. It is remarkable to note that the government of Nepal has also created a national data profile (http://nationaldata.gov.np/), an online platform of data on various issues such as geography and nature, resources, capacity development potentiality, SDGs, and others. This data profile also includes an SDGs' option, but when searching for the status and progress of SDGs' indicators, the data are not available, even for 2019. It would be better if this platform were designed in such a way as to present the status and track the progress of the SDGs.

The case of local government is somehow different. When we asked the IT officers about the SDGs' monitoring platform, all of them said that there is no digital platform available to collect and monitor the progress of the SDGs. They generally collect data manually, and enter it into a Microsoft Excel file on their computers. The traditional paper-based system of data collection, followed by manual entry into a Microsoft Excel file, is tedious and time-consuming and requires a hefty amount of investment. The collection of data and its use for monitoring progress towards the SDGs can be easily accomplished through a digital system that can be accessed from every level of government structure. The establishment of digital systems at every level will be helpful in data generation and acquisition. The use of technology enhances the process of data acquisition and transfer. The technology further supports data analysis and processing to generate the concerned results. The availability of digital data makes it easier to keep track of the indicators required to track the SDG goals. The indicator data has to be collected using digital technology from various levels and responsible organizations. The presence of digital applications will capture the required data in digital format. Once the required data are available in the system, they can be shared with the concerned organization instantaneously for further processing. The data acquisition by the concerned agency will be a much easier and less time-taking task if the data are available in digital format. The sharing and interoperability of the data through a digital system further speed up the process.

Monitoring and Evaluation Framework

The NPC has been working to bridge the gap between the data needed to monitor the SDGs and the availability of existing data. The development of comprehensive and disaggregated monitoring databases is critical to achieving the SDGs, and surveys are needed to meet the SDGs' data gap. The NSO has taken initiatives to manage SDGs' friendly data, including

the formation of an inter-ministerial SDGs' indicators coordination committee, and serving on the NPC's thematic governance committee. In addition, the NSO focuses on generating and disseminating the data needed to monitor the SDGs (NPC, 2017c). Numerous initiatives have been taken by the NPC in the field of monitoring and evaluation. The monitoring and evaluation guidelines, released by the NPC in 2013, seek to ensure responsibility and accountability among the key constituents involved in service delivery, allow for the evaluation and measurement of direct and indirect effects of development interventions on the lives of people and ensure development results effectively and efficiently on time (NPC, 2013). While the monitoring and evaluation of development plans, policies and programs started with the planned development system in Nepal in 1956, the systematic implementation of evaluation of development projects started from the 5th plan (1975 -1980) (NPC, 2013). Since the 8th plan (1992-1997), monitoring and evaluation have been strengthened as a system (NPC, 2013), which now focuses on results-oriented monitoring and evaluation of all development activities, including the SDGs. The NPC has issued an integrated national evaluation action plan (2016 – 2020), with the intention to improve national evaluation capacity and better align the SDGs for effective implementation. The action plan places particular emphasis on creating a conducive atmosphere to evaluate the SDGs from a Nepali perspective, develop assessment skills, strengthen networking and coordination, conduct monitoring and evaluation in line with the SDGs, and document and disseminate evaluation findings to refine SDGs' policies, programs, and interventions for inclusive planning and implementation (NPC, 2017d). This helps somehow to monitor and evaluate development activities in line with the SDGs, but the problem is that Nepal still lacks systematically verified, disaggregated data aligned with the SDGs at the national and local levels, creating a barrier to monitoring and evaluation of the SDGs' progress. This barrier can be addressed through the use of digital technology.

Digital framework for connecting governments and agencies at various levels

Developing countries like Nepal face finance, technology, and capacity gaps in successfully implementing the SDGs, and these gaps need to be concretely measured with appropriate needs assessment tools so that the funding and increased implementation capacity can be objectively determined. Governments should identify technological measures to assess constraints on implementing and achieving the SDGs. The government of Nepal should search for a strategic departure to impart digital information systems to connect the government and agencies at various levels. The phase of digitization has already been imparted where most of the work at every level of government has been computerized. Now it is the time for the government of Nepal to focus on implementing digital systems at all levels of the government.

The systems will help in the acquisition of the data, storage, and analysis of the data. The monitoring data for SDG projects can be acquired through digital systems that are the part of e-Government systems. The data acquired through these systems will be used as the input indicators of development goals.

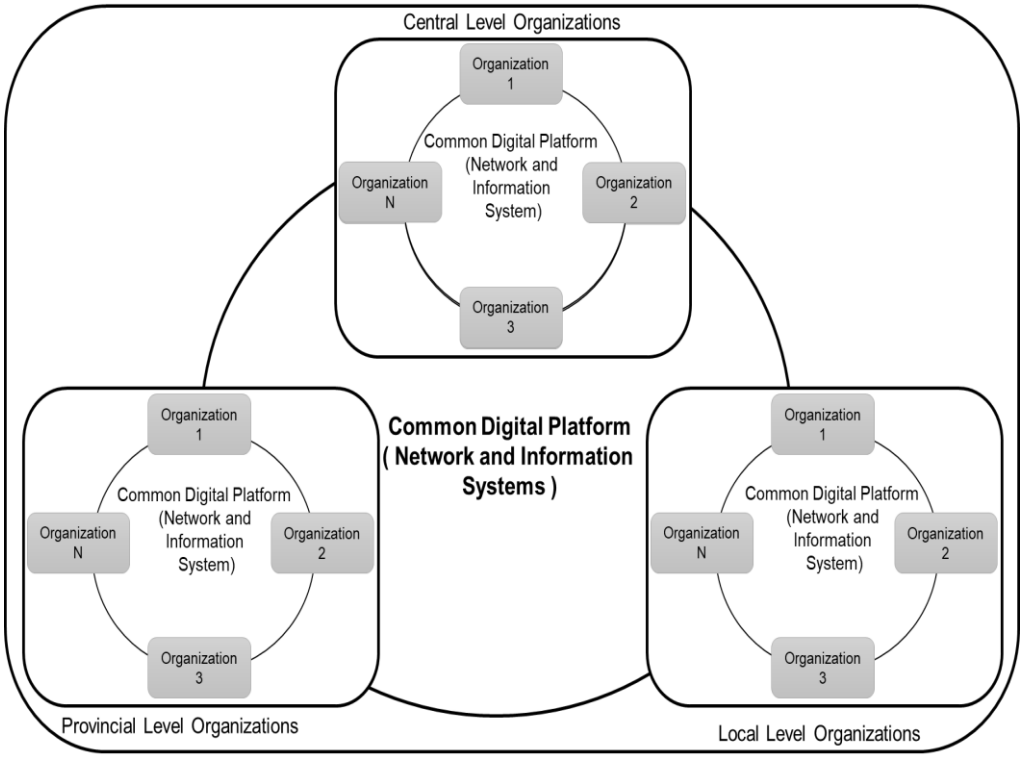

Figure 2. Conceptual framework of networked digital systems at various levels

Figure 2 shows a conceptual framework for establishing a networked digital system structure within the governments and agencies working at various levels. Public organizations at every level of government should be connected through a common digital platform, which includes network infrastructure and information systems that share data through their back-end operation. The establishment of networked digital systems among governments at various levels ensures the acquisition and sharing of data easily and quickly with the support of ICT. The government leadership has to be aware of the management of data. The data that are generated and stored at the lowest level should have integrity. There has to be uniformity in the architecture of the systems so that the systems at various levels can communicate with each other. This requires the development of a common digital platform with common enterprise architecture. This will facilitate the transfer of information between different organizations at different levels with ease and in a short period as the same data gets populated. To ensure this

the government leadership has to work together to develop a common digital framework. The initiative will help to establish e-Government systems that will pave the path of digital governance.

Conclusion

The SDGs are formulated to establish sustainable development by allowing the countries to achieve their goals. These goals are measured with the targets and they are achieved through the defined and identified indicators. The indicators of the targets are achieved and measured by various organizations working at different levels. Monitoring of the SDGs is very much necessary to track the progress of the development goals regularly. To track the process of the goals, relevant data must be obtained from the concerned implementation organizations. Currently, most of the data are collected through surveys or captured in various information systems. The survey data are digitized to perform analysis and obtain results. The existence of e-Government applications at various levels of government to capture the data provides quick access to the required and relevant data when needed. To do so there is a need for a network among the organizations working at various levels, and access to the information systems or sharing of the acquired data on a common digital platform. This establishes a networked digital system where all government organizations share data through the use of ICT, which includes the use of computers, networks, databases, and information systems. Currently, Nepal is moving towards the implementation of e-Government systems at the organisational level which needs to be connected at the government level giving rise to a complete digital governance system. Once such a system is established then the capture of the monitoring indicators will be quick, real-time, and easy. Real-time and quick access to such data is necessary to monitor the real-time improvements of the defined indicators. In Nepal there exists three level of government and the intergovernmental relationship is very much crucial to coordinate and execute development work. So, to meet the SDGs, the coordination, communication, and sharing of data among government agencies play an important role. The use of ICT to facilitate the coordination, communication, and sharing of data among government agencies is necessary as ICT is finding its way into the public administration and government service delivery system. Thus, the e-Government systems should be developed as a common communication and data-sharing platform where the required data are exchanged as needed. This requires aware and committed leadership in the leading position of the government at every level.

References

Avtar, R., Aggarwal, R., Kharrazi, A., Kumar, P., & Kurniawan, T. A. (2020). Utilizing geospatial information to implement SDGs and monitor their progress. *Environmental Monitoring and Assessment*, *192*(1), 1–21. doi.org/10.1007/s10661-019-7996-9

Bongiorno, G., Rizzo, D., & Vaia, G. (2017). *CIOs and the Digital Transformation: A New Leadership Role*, 1–230. Springer, Cham. doi.org/10.1007/978-3-319-31026-8

Busch, T. (2011). Capabilities in, capabilities out: Overcoming digital divides by promoting corporate citizenship and fair ICT. *Ethics and Information Technology*, *13*(4), 339–353. doi.org/10.1007/s10676-010-9261-3

Ciarli, T., Kenney, M., Massini, S., & Piscitello, L. (2021). Digital technologies, innovation, and skills: Emerging trajectories and challenges. *Research Policy, 50*(7), 1-10. doi.org/10.1016/j.respol.2021.104289

Deneulin, S. (2009). Ideas related to human development. In S. Denuelin & l. Shahani (Eds.), An Introduction to the Human Development and Capability Approach: Freedom and Agency (pp.49-66). Earthscan, IDRC.

Dunleavy, P., & Margetts, H. (2015, September). *Design principles for essentially digital governance.* Paper to the 111th Annual Meeting of the American Political Science Association, San Francisco. Retrieved from https://bit.ly/3Z12Zdz

Florini, A., & Pauli, M. (2018). Collaborative governance for the sustainable development goals. Asia & the Pacific Policy Studies, 5(3), 583-598. doi.org/10.1002/app5.252

Hák, T., Janoušková, S., & Moldan, B. (2016). Sustainable development goals: A need for relevant indicators. *Ecological Indicators*, *60*, 565–573. doi.org/10.1016/j.ecolind.2015.08.003

Haywood, L., & Funke, N. (2019). *The sustainable development goals: A new nexus for sustainable development*. CSIR. Retrieved from https://bit.ly/3I3Le6x

Jönsson, K., & Bexell, M. (2021). Localizing the sustainable development goals: The case of Tanzania. *Development Policy Review, 39*(2), 181-196. doi.org/10.1111/dpr.12497

Kumar, P., Dasari, Y., Jain, A., & Sinha, A. (2017). Fake order mitigation: A profile based mechanism. In A. K. Kar, P. V. Ilavarasan, M.P. Gupta, Y. K. Dwivedi, M. Mäntymäki, M. Janssen, A. Simintiras, & S. Sharhan (Eds.), *Digital Nations–Smart Cities, Innovation, and Sustainability* (pp. 276-288). Springer International Publishing.

Lock, I., & Seele, P. (2017). Theorizing stakeholders of sustainability in the digital age. *Sustainability Science*, *12*(2), 235–245. doi.org/10.1007/s11625-016-0404-2

Maaroof, A. (2015). *Big data and the 2030 agenda for sustainable development.* UN-ESCAP Environment and Development Policy Section. Retrieved from https://bit.ly/3VEJuGo

Marcovecchio, I., Thinyane, M., Estevez, E., & Janowski, T. (2019). Digital government as implementation means for sustainable development goals. *International Journal of Public Administration in the Digital Age* , *6*(3), 1–22. doi.org/10.4018/IJPADA.2019070101

McInnes, R. J. (2018). Sustainable development goals. In C. M. Finlayson et al. (Eds.), T*he Wetland Book* (pp.631-636). Springer. /doi.org/10.1007/978-90-481-9659-3_125.

Mondejar, M. E., Avtar, R., Diaz, H. L. B., Dubey, R. K., Esteban, J., Gómez-Morales, A., ... & Garcia-Segura, S. (2021). Digitalization to achieve sustainable development goals: Steps towards a smart green planet. *Science of The Total Environment, 794*, 1-20. doi.org/10.1016/j.scitotenv.2021.148539

Morton, S., Pencheon, D., & Squires, N. (2017). Sustainable development goals and their implementation: A national global framework for health, development and equity needs a systems approach at every level. B*ritish Medical Bulletin, 124*, 81-90. doi.org/10.1093/bmb/ldx031.

National Planning Commission (NPC). (2013). *National monitoring and evaluation guidelines*. Retrieved from https://bit.ly/3Hc4gc2

National Planning Commission (NPC). (2016). 14th plan (2016/17–2018/19). *National Planning Commission*. Retrieved from https://bit.ly/3IC1SeI

National Planning Commission (NPC). (2017a). *National review of sustainable development goals*. Retrieved from https://bit.ly/2BgtEu6

National Planning Commission (NPC). (2017b). S*ustainable development goals: Status and roadmap, 2016-2030*. Retrieved from https://bit.ly/3KgoGlB

National Planning Commission (NPC). (2017c). *Nepal's sustainable development goals: Baseline report*. Retrieved from https://bit.ly/3HjdG5G

ational Planning Commission (NPC). (2017d). I*ntegrated national evaluation action plan of Nepal (2016 - 2020).* Retrieved from https://bit.ly/3VC8NZK

National Planning Commission (NPC). (2019). *15th development plan (2019/20-2023/24)*. Government of Nepal. https://bit.ly/3aqQiAA

National Planning Commission (NPC). (2020). N*ational review of sustainable development goals*. Retrieved from https://bit.ly/3I3uwEo

Robra, B., & Heikkurinen, P. (2019). Degrowth and the sustainable development goals. In W. L. Filho, A. M. Azul, L. Brandli, P.G. Özuyar, & T. Wall, (Eds), Decent Work and Economic Growth. Springer, Cham. doi.org/10.1007/978-3-319-71058-7_37-1

Saner, R., Yiu, L., & Nguyen, M. (2020). Monitoring the SDGs: Digital and social technologies to ensure citizen participation, inclusiveness and transparency. *Development Policy Review, 38*(4), 483–500. doi.org/10.1111/dpr.12433

Sachs, J. D. (2012). From millennium development goals to sustainable development goals. *The Lancet, 379*(9832), 2206–2211. doi.org/10.1016/S0140-6736(12)60685-0

Schmidt-Traub, G., De la Mothe Karoubi, E., & Espey, J. (2015). I*ndicators and a monitoring framework for the sustainable development goals: Launching a data revolution for the SDGs*. Sustainable Development Solutions Network. Retrieved from https://bit.ly/3k6fo0T

Spash, C. L. (2011). Social ecological economics: Understanding the past to see the future. American. *Journal of Economics and Sociology, 70*(2), 340-375. https://doi.org/10.1111/j.1536-7150.2011.00777.x

Tsumagari, M. I., & Gupta, A. K. (2019). Know your citizens for transforming public service delivery: A step taken in Nepal by national governance survey. *Journal of Management and Development Studies, 29*, 69–84.

United Nations. (2013). Implementation, accountability and building consensus. In J. H. Coplan (Eds), A new global partnership: Eradicate poverty and transform economies *through sustainable development. The report of the high-Level* (pp. 276-288). New York: United Nations Publications Street.

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. Retrieved from https://bit.ly/2YRtLrW

United Nations. (2019). *A global indicator framework for the sustainable development goals and targets of the 2030 agenda for sustainable development*. Retrieved from https://bit.ly/3XAFSp6

Webster, N., & Ravnborg, H. M. (2016). *Monitoring the implementation of the sustainable development goals: The role of the data revolution*. European Parliament. Retrieved from https://bit.ly/3IaigSe

World Commission on Environment and Development (WCED). (1987). *Our common future*. Retrieved from https://bit.ly/3lz1eS1

Zuboff, S. (1988). *In the Age of the Smart Machine: The Future of Work and Power.* Basic Books, Inc.